



**QUEEN'S
UNIVERSITY
BELFAST**

Increasing burden of antimicrobial resistance in pseudomonas aeruginosa from adult patients with cystic fibrosis (CF) in Northern Ireland: Then and now

Gramegna, A., Moore, J. E., McCaughan, J., Millar, B. C., Ewing, J., Elborn, J. S., Blasi, F., & Downey, D. G. (2018). Increasing burden of antimicrobial resistance in pseudomonas aeruginosa from adult patients with cystic fibrosis (CF) in Northern Ireland: Then and now. *Ulster Medical Journal*, 87(2), 129-130.
https://www.ums.ac.uk/087_2.html

Published in:
Ulster Medical Journal

Document Version:
Publisher's PDF, also known as Version of record

Queen's University Belfast - Research Portal:
[Link to publication record in Queen's University Belfast Research Portal](#)

Publisher rights

Copyright 2018 the authors.
This is an open access article published under a Creative Commons Attribution-NonCommercial-ShareAlike License (<https://creativecommons.org/licenses/by-nc-sa/4.0/>), which permits use, distribution and reproduction for non-commercial purposes, provided the author and source are cited and new creations are licensed under the identical terms.

General rights

Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Letters

INCREASING BURDEN OF ANTIMICROBIAL RESISTANCE IN *PSEUDOMONAS AERUGINOSA* FROM ADULT PATIENTS WITH CYSTIC FIBROSIS (CF) IN NORTHERN IRELAND: THEN AND NOW

Editor,

Cystic fibrosis (CF) is characterised by defective mucociliary clearance and chronic airway infection.¹ The most commonly isolated pathogen from CF airways is a Gram-negative bacterium, *Pseudomonas aeruginosa* (PA).² Chronic PA infection is associated with significant morbidity and mortality in CF patients³ and necessitates multiple antibiotic courses.² Antimicrobial resistance (AMR) in PA may be driven by the exposure of bacterium to antibiotic, either in the acute setting or during anti-pseudomonal chronic suppressive therapy. We examined AMR from PA isolates from a single adult CF centre, by comparing antibiotic susceptibility from contemporary isolates with a collection from 13 years ago.

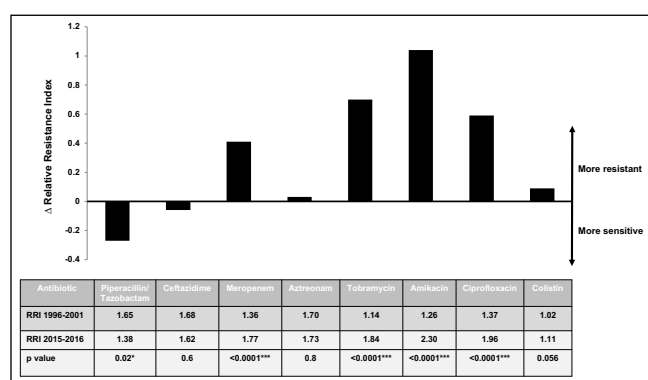


Fig 1. Change in mean Relative Resistance Index [RRI] over a 13 year period with respect to *Pseudomonas aeruginosa* isolates (n=200) from the sputum of adult CF patients

Two collections of PA isolates were examined, each consisting of 100 non-duplicated organisms, which had isolated from the sputum of adult CF patients attending the Northern Ireland Adult Cystic Fibrosis Centre, Belfast City Hospital. Collection A was isolated during the period 1996-2001 and Collection B (2015-2016). Microbiological isolation of PA was performed from freshly expectorated sputum, by employment of selective culture for 24-48h, followed by biochemical confirmation with API20NE identification strips (Biomérieux Ltd, UK). Antibiotic susceptibility was performed on each isolate by standard disk diffusion assay and resulting zone sizes were interpreted against published CLSI criteria. Eight antibiotics from three classes of antibiotics were examined, including beta-lactams, fluoroquinolone and polymyxin, as detailed in Figure 1. Antibiotic susceptibility was quantified by employment of a novel marker, Relative Resistance Index [RRI], as recently described.⁴ Briefly, qualitative “sensitive”, “moderately resistant” and “resistant” data were converted into a quantitative RRI value, through

employment of an algorithm.⁴ An unpaired two-tailed t-test was used for comparison of trends between these two periods and a probability (p) value of less than 5% (p<0.5) was considered statistically significant. There were no differences in the microbiological isolation methodology nor with the antibiotic susceptibility methodology between these two collection periods.

A comparison of RRI scores between the two collection periods is shown (Figure 1). RRI and AMR increased significantly for ciprofloxacin (p<0.0001)***, aminoglycosides (both amikacin and tobramycin, p<0.0001)*** and meropenem (p<0.0001)*** for PA isolates from 1996-2001 to 2015-2016. There was reduction in AMR during this period with piperacillin/tazobactam and ceftazidime.

Overall, this study showed markedly greater resistance in the 2015-2016 PA cohort. Increase in AMR may reflect chronic exposure of PA to several classes of antibiotics used in the management of CF airways infection. Until now, it has been relatively difficult to perform comparative studies on AMR in CF, due to the reliance on generating largely qualitative data (S, I & R) from disk diffusion assay. However, RRI may help tracking changes in resistance patterns either at a population level or at an individual patient level, either with a single antibiotic agent, several agents within a single class or collectively between antibiotic classes.

This approach may be useful in helping to track emergence in AMR epidemiologically, those agents which display the greatest shift in AMR, as well as helping to guide antimicrobial stewardship practices and policies in CF.

FUNDING

Author AG was funded by a grant from the Società Italiana di Pneumologia/Italian Respiratory Society (SIP/IRS). The funding Society did not contribute to the content of this manuscript.

The authors have no interests to declare.

Andrea Gramegna^{1,2,3*}, John E. Moore^{1,2,4,5}, John McCaughan^{1,2}, B. Cherie Millar^{1,2,5}, Judith Ewing², J. Stuart Elborn^{4,6}, Francesco Blasi³ and Damian G. Downey^{2,4}

¹ Department of Bacteriology, Belfast City Hospital, Belfast Health & Social Care Trust, Lisburn Road, BELFAST, BT9 7AD, Northern Ireland,

² Regional Adult Cystic Fibrosis Centre, Belfast City Hospital, Belfast Health & Social Care Trust, Lisburn Road, BELFAST, BT9 7AD Northern Ireland,

³ Department of Pathophysiology and Transplantation, Università degli Studi di Milano, Internal Medicine Department, Respiratory Unit and Regional Adult Cystic Fibrosis Center, IRCCS Fondazione Cà Granda Ospedale Maggiore Policlinico, Milan, Italy

⁴ Centre for Experimental Medicine, Queen's University Belfast, Northern Ireland,

⁵ School of Biomedical Sciences, Ulster University, Cromore Road, Coleraine, BT52 1SA, Northern Ireland.

⁶ Imperial College and Royal Brompton Hospital, London

Correspondence to: Dr. Andrea Gramegna, Department of Pathophysiology and Transplantation, Università degli Studi di Milano, Internal Medicine Department, Respiratory Unit and Regional

Adult Cystic Fibrosis Center, IRCCS Fondazione Cà Granda Ospedale
Maggiore Policlinico, Milan, Italy.

gramegna.med@gmail.com

REFERENCES

1. Fodor AA, KlemER, Gilpin DF et al. The adult cystic fibrosis airway microbiota is stable over time and infection type, and highly resilient to antibiotic treatment of exacerbations. *PloS one* 2012; 7:, e45001.
2. Elborn JS. Cystic fibrosis. *Lancet*. 2016; 388(10059):2519-2531.
3. Høiby N. Recent advances in the treatment of *Pseudomonas aeruginosa* infections in cystic fibrosis. *BMC Med*. 2011; 9(32):1-7.
4. Ewing J, McCaughan J, Moore JE, Fairley D, Sutherland B, Reid A, Downey D. Relative resistance index (RRI) - a scoring system for antibiotic resistance in *Pseudomonas aeruginosa*. *Br J Biomed Sci*. 2017; 74(4):198-202.



UMJ is an open access publication of the Ulster Medical Society (<http://www.ums.ac.uk>).

The Ulster Medical Society grants to all users on the basis of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Licence the right to alter or build upon the work non-commercially, as long as the author is credited and the new creation is licensed under identical terms.